Draft Final Conceptual Site Model for the Yerington Mine Site

August 26, 2002

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Subject: Draft Final Conceptual Site Model and Response to Comments on the Draft Conceptual Site Model dated June 13, 2002

Please find enclosed, the Draft Final Conceptual Site Model and Response to Comments on the Draft Conceptual Site Model dated June 13, 2002. Atlantic Richfield Company appreciates this opportunity to respond to the comments provided by the regulatory agencies on July 30 2002 for the subject document. The following responses are also based on the Yerington Technical Work Group (YTWG) meeting held on June 13, 2002.

General Comments

This document should be considered a stand-alone document. As it functions as an introduction to the sources and chemicals of concern (COCs), enough background must be included to establish that all potential sources and COCs are included. The conceptual site model (CSM) presented in the draft report is a good start at describing the source areas, migration pathways, and end-point receptors associated with metals fate and transport at the Site. The CSM is important because it allows us to evaluate and prioritize characterization and remediation activities, to develop data quality objectives and design remedial goals, to determine which source areas can be appropriately grouped into operable units, and to assess the impact potential remedial alternatives will have on the Site as a whole.

We agree that the CSM should be considered draft at this stage of the overall Site investigation. However, while it may not be possible to provide details of sources and pathways based on our current knowledge of the Site (p.1, & 2 of draft CSM report), the CSM should be refined as more environmental data are received. Greater specificity regarding COCs is appropriate at this stage. The CSM document should be maintained and updated as our understanding of the Site and the associated fate and transport processes improves. As mentioned before, historical plant records and supplemental historical interviews must be utilized to demonstrate that any potential sources have been identified.

All potential contaminant source areas need to be identified for future investigations. The pit lake, sewage ponds, landfills, and asbestos pipe need to be shown and addressed. Also, please include a general discussion of proposed land use.

Response to General Comments

Atlantic Richfield agrees that the conceptual site model (CSM) should be considered a stand-alone document, and should serve to introduce potential sources and chemicals of concern (COCs), as well as potential media pathways and potential receptors. We also agree that sufficient background information must be available to identify potential COCs. However, until more site investigations are conducted pursuant to the Closure Scope of Work (SOW), Atlantic Richfield does not believe sufficient information is available to confidently select the appropriate COCs.

Atlantic Richfield appreciates, and agrees with, the comments that state:

- *"the draft CSM is a good start at describing the source areas, migration pathways, and end-point receptors associated with metals fate and transport at the Site";*
- *"the CSM should be considered draft at this stage of the overall Site investigation"; and*
- *"the CSM should be refined as more environmental data are received".*

As mentioned previously in this response, we believe that greater specificity regarding COCs may be premature at this stage. However, the revised text in the document will reflect the list of COCs described in the U.S. EPA's as a conceptual starting point for further evaluation during the site investigations described in the SOW.

Atlantic Richfield agrees that the CSM document should be updated as our understanding of the Site and the associated fate and transport processes improves. Historical records and supplemental interviews have been incorporated into the Work Plans that describe some of the mining operations and mine units at the site and, where appropriate, will be expanded during the site investigations to demonstrate that any potential sources have been identified.

We agree that all potential contaminant source areas need to be identified for future investigations including, but not limited to, the pit lake, sewage ponds, landfills, and asbestos pipe.

Until all site investigations are completed, and their results integrated into a Final Permanent Closure Plan (FPCP), Atlantic Richfield believes that a discussion of proposed post-closure land use is premature. Post-closure land use will be evaluated in the FPCP.

<u>Specific Comments -- Page 1</u>

Comment no. 1: Potential Sources, Discharges of Process Water; Historical records and aerials have demonstrated that unlined ditches and drains may also be potential sources and should be investigated. Data is limited in many areas of the site, however, a general list of COCs analyzed for and detected to date should be included.

Response to Comment no. 1: Atlantic Richfield agrees that unlined ditches and drains may be potential sources, and these mine process components will be investigated in the Tailings Area and Evaporation Pond Work Plan. This Work Plan will review all historical data and include a parameter list for soil samples and, potentially, for water samples that will be analyzed as part of that Work Plan..

Comment no. 2: Evaporation ponds have been identified as potential sources of contaminants of concern (COCs) to underlying soils, soil water, and ground water. Is there any potential for the evaporation products (for example, salts) to be entrained by winds and escape the Site proper as fugitive dust? Similarly, does the spray evaporation system contribute to elevated metals concentrations in fugitive dust?

Response to Comment no. 2: Please see Response to Comment no. 1. Atlantic Richfield will investigate the potential for fugitive dust emissions from these ponds in the Tailings Area and Evaporation Pond Work Plan. The potential for the spray evaporation system to contribute to elevated metals concentrations in fugitive dust emissions will be evaluated during site investigations described in the Arimetco Heap Leach and Process Components and Fugitive Dust Work Plans.

<u>Specific Comments -- Page 2</u>

Comment no. 3: Potential Pathways; Text and investigations should also include discharges and spills of solutions from site operations.

Response to Comment no. 3: Potential Pathways; The revised CSM text will describe this, and the Arimetco Heap Leach and Process Areas Work Plans will address the investigations.

Comment no. 4: Potential Pathways; Percolation of process waters into the subsurface was identified as a potential historic release mechanism that likely ceased when mining operations ended. Since the installation of the ground-water pumpback system, water withdrawn from the shallow zone of the aquifer has been discharged into the same unlined and lined evaporation ponds on the site. What was(is) the potential for these waters to percolate downward into the subsurface? What evidence supports the hypothesis that infiltration from the evaporation ponds no longer is a release mechanism?

Response to Comment no. 4: This issue will be evaluated in the Tailings Area and Evaporation Pond Work Plan. Lining of the currently operational evaporation ponds suggests that these are not likely sources at the present time. However, at present, these ponds are considered as potential sources in the CSM.

Comment no. 5: Erosion; Text and investigations should include depositional areas that may in turn become secondary source areas.

Response to Comment no. 5: The CSM text will reflect this comment.

Comment no. 6: Transport Mechanisms; Text should include that the historic discharges to drainage ditches may have resulted in surface water transport along the drain and possibly into the seasonal wetland both on and downstream of tribal lands. Also, potential release of COCs from the sediments present inside the Wabuska Drain as well as along the banks and in the seasonal wetlands should be considered.

Response to Comment no. 6: The revised CSM text will indicate that historic discharges to designed solution collection ditches occurred. The revised text will also indicate that mine-related groundwater may also have entered the Wabuska Drain. The existing text already describes the potential for flows in the Wabuska Drain to reach down-gradient receptors. Specifying that flows may have reached the seasonal wetland on, and downstream, of tribal lands is premature at this time. This question is to be resolved as part of the Wabuska Drain Work Plan, as is the question whether COCs can be released from Drain banks or the wetlands.

Comment no. 7: Transport Mechanisms; Characterizing the subsurface geochemical conditions and understanding the geochemical processes are crucial steps to evaluating the mobilization and attenuation of COCs at the Site. At present, the CSM lacks Site specific geochemical data to support any hypotheses on the fate and transport of COCs. The CSM will need to be refined as data are collected and processes are defined. This will allow the technical work group to evaluate the impact that different remedial strategies will have on individual mine units, as well as the Site as a whole.

Response to Comment no. 7: Since the CSM is not intended to be quantitative, we agree that the CSM lacks site-specific geochemical data to support any hypotheses on the fate and transport of COCs, and that the CSM will need to be refined as data are collected and source-pathway-receptor processes are defined.

Comment no. 8: The Pit Lake at the Yerington Mine site has been described as an evaporative sink. What evidence supports this hypothesis? Has a water balance been determined for this Pit Lake system? At what point in the future will the level of water in the Pit reach the pre-mining water level? At that time, will evaporation from the Pit lake surface be sufficient to sustain radial flow towards the Pit or will the Pit Lake become a flow-through system? What is the current capture zone for the Pit Lake system? If radial flow towards the Pit continues after the water surface reaches the pre-mining level, how will the predicted capture zone differ from the current capture zone?

Response to Comment no. 8: All pit lakes that are excavated in bedrock flow systems in a net evaporative environment, like most of Nevada where the evaporation rate far exceeds the precipitation rate, function as evaporative sinks (at least on an average annual basis). This has been supported numerous times by analytical and numerical models of pit lakes through the NEPA processs, and by empirical data for closed mine sites with pit lakes. However, the Yerington Pit Lake is, at the present time, receiving some possibly increased flow from the alluvial aquifer near the Walker River. These inflows may influence the water balance. The purpose of the Yerington Pit Lake Work Plan will investigate the water balance conditions of the pit, and attempt to answer the remaining questions in this comment.

<u>Specific Comments Page 3</u>

Comment no. 9: Potential Receptors and Exposure Routes; Uptake of contaminants from soil and water by plants should also be included in the discussion in this section. The text should also recognize that bioaccumulation may occur through the food chain for various biotic receptors. Exposure routes to ecological receptors should also include dermal contact and inhalation of dust.

Response to Comment no. 9: The revised CSM text will reflect these concepts. However, it is highly unlikely that the risk to ecological receptors via dermal contact and inhalation of dust can, or ever will, be quantified.

Comment no. 10: Exposure routes to human receptors should include ingestion of terrestrial and aquatic biota that have been exposed to contaminants. Examples could include human consumption of waterfowl, that have used the pit lake and consumption of fish from Wabuska Drain or possibly the Walker River downstream of its confluence with Wabuska Drain. Specific exposure scenarios that encompass actual tribal subsistence exposures will be developed in consultation with the tribes in preparation for the risk evaluation.

Response to Comment no. 10: These concepts will be incorporated into the revised CSM text.

<u>Specific Comments to Figure 1</u>

Comment no. 11: Change "Water (Wabuska Drain)" to "Surface Water". Draw an arrow from Sediment to Surface Water, as surface waters may remobilize contaminants from sediments. Add Terrestrial Biota as a potential receptor from Fugitive Dust. It also seems that there may be dermal contact and incidental ingestion (Exposure Routes) from Fugitive Dust, although minor, as well as dermal contact with sediment.

Some of the specific ecological receptors include livestock (horses) and crops. Dermal exposure route should be added for sediment for human receptors.

An arrow should be drawn from Groundwater to the Yerington Pit Lake.

Please add a key to the chart, showing, at a minimum, the purpose of the black, dotted and blue lines.

For Groundwater: Potential Receptors include livestock and crops. Exposure Route should include dermal contact.

Food chain pathways should be listed on the figure. For example, fish or hunting of game (deer/rabbit).

Add a box in the Potential Sources column for secondary sources to account for a) dust re-suspended and b) sediments to the Wabuska Drain (contaminants to surface or groundwater).

Response to Comment no. 11: The recommended changes will be implemented. However, the portrayal of food chain pathways is beyond the intent of what the figure is attempting to clarify. Also, the request to add a box in the Potential Sources column for secondary sources to account for a) dust re-suspended and b) sediments to the Wabuska Drain (contaminants to surface or groundwater) will be depicted on the diagram in a different manner than suggested, but should satisfy the intent of the request.

Specific Comments to Figure 2

Comment no. 12: Show the direction of flow of the Walker River and also Wabuska Drain. The linkage between Wabuska Drain and the Walker River should be shown. Humans are illustrated as receptors, therefore it would not be inappropriate to put a duck, as a representative species, on the pit lake. The cross section through the tailings pile should also apply to the leach pad. Landfill units should be added to the figure, as well as monitoring wells.

Please add a key for the figure.

The pump back well diagram shows an ideal cone of depression, which is not realistic or actual. The pump back system may not be an effective barrier to impacted groundwater and the drawing should demonstrate that some contaminated or mine impacted groundwater is passing through the line of wells. Ponds with poor, ineffective liners (asphalt) reside down gradient of the pump back wells. This should also be shown.

Ground water could be a potential secondary source of contamination to the pit lake and the pit lake could be a source of contamination to groundwater and/or the Walker river.
Add alluvial fan type deposition on Western side of site. This deposition could range from large boulders to fine grained sediments.

Show surface down gradient trends to be north.

At least three types of landfills exist, (municipal waste, flood debris, mine process and equipment waste/debris) these should be shown on the diagram and investigated as potential contaminant source areas. Add sewer treatment ponds as potential sources of ground water impacts.

The Transite Pipe may be source of asbestos that needs to be shown on the diagram.

As mentioned above, there is indication that other unlined ditches and drains may also be potential sources and should be demonstrated on the figure. Historical riverbed channels may be beneath the site and may act as conduits for contaminated groundwater transport. This should also be shown.

Fugitive dust should be depicted as a potential secondary source.

The Pit Lake also should be shown as a potential source to groundwater.

There are other potential areas of surface soil contamination that should be depicted on the figure. For example, areas near the process areas where there are stains. Other features like the electrowinning facility and the transformer recycling operations should be shown on the figure. Currently we assume that they would be included within the Process Areas. Maybe add text to this title to include these other potential sources. Same comment applies to the small "jumpout" map entitled Cross Section Through Arimetco Leach Pad. Possibly make the title more generic to include other potential sources.

Please show connection between Wabuska Drain and the Walker River (possibly an arrow). Also, there is a potential for terrestrial and aquatic biological receptors impacted by groundwater discharges to irrigation ditches and the Walker River (depending on groundwater surface water interactions in the vicinity of the Site).

Include livestock in the agricultural areas.

Response to Comment no. 12: The revised figure will show the direction of flow of the Walker River and also Wabuska Drain. Given the intent of the schematic, it will not be possible to actually show the confluence of the Wabuska Drain and the Walker River, but an arrow could work. A duck on the pit lake has been added as a representative species. We agree that the cross sections could be applicable to more than one type of surface mine unit, and will attempt to consolidate these sections. Landfill units and monitoring wells will be added to the figure

A key for this type of figure is not useful. The text will be expanded to better describe the information presented in the figure.

The block diagram is intended to schematically represent potential site sources, pathways and receptors. No one is certain of the drawdown cone geometry associated with a pumpback system well, and since the wells are completed in an alluvial aquifer, the "ideal" cone shape is appropriate for the conceptual diagram. Whether or not the pumpback system is an effective barrier to groundwater flow from the mine site is yet to be determined through the implementation of the Groundwater Conditions Work Plan. The ideal cone of depression in this schematic block diagram does not imply anything about the effectiveness of the pumpback system. Again, the schematic is attempting to depict process, evaporation and tailings ponds, in general, as potential sources. Specific details such as the description and evaluation of ponds with possible poor, ineffective liners should be left to the specific Work Plans.

For this schematic diagram, the specifics regarding the hydraulic connection between groundwater flow in alluvial and bedrock flow systems, the Yerington Pit Lake and the Walker River may be difficult to depict. Atlantic Richfield will attempt to provide more of these details on the diagram without overcrowding the figure. However, if these details are incorporated, other details would be left out, creating a schematic diagram that is inconsistent. These details, and alluvial fan depositonal environments will be discussed in the revised CSM text. Also, these details will be discussed at length in the Groundwater Conditions Work Plan and depicted graphically.

The figure has been modified to "Show surface down gradient trends to be north", and to the east as these are the general topographic trends at the site.

The revised figure will include a generic landfill and a generic sewage treatment pond as potential sources of groundwater impacts.

Transite pipe may be source of asbestos, but that is too detailed for the intent of the schematic. A generic pipeline has been added to the schematic. Text describing transite pipe as a possible source has also been added to the CSM.

Please see Response to Comment no. 1. As far as detailed hydrogeologic information is concerned, such as historical riverbed channels beneath the site, this level is too detailed for the schematic and is best addressed in the Groundwater Conditions Work Plan, which presents a conceptual hydrogeologic model.

Fugitive dust will be depicted as a potential secondary source on the schematic.

The Pit Lake will be shown as a potential source to groundwater.

Atlantic Richfield attempted to present generic sources on the schematic, including potential areas of surface soil contamination and the electro-winning plant under the general depiction of Process Areas. Former transformer recycling operations are best presented in the more specific Process Areas Work Plan. As appropriate, the revised figure will present an idealized cross section for more than one type of surface mine unit (e.g., combine leach pad with waste rock pile).

Please see the first paragraph under this response regarding how best to represent the connection between the Wabuska Drain and the Walker River. The discussion of potential groundwater discharges to irrigation ditches and the Walker River is too detailed for the CSM, but will be addressed in the Groundwater Conditions Work Plan.

A picture of a cow is included in the agricultural area.

Specific Comments to Figure 3

Comment no. 13: Although the focus here is on mine units, it would be helpful to label the following: Weed Heights, as it shows the proximity of humans to the site as well as showing its location; the location of Wabuska Drain, and the location of the Walker River.

Please add the Former Plant Site where Arimetco later constructed the Megapond.

It appears that the Waste Rock Area (North) was actually a low grade stockpile. It was also a former Anaconda Leach Pad and was operational for an undetermined length of time.

Response to Comment no. 13: Weed Heights and the Walker River are now labeled on the figure. The southern portion of the Wabuska Drain will be included in the revised figure.

The Former Plant Site is labeled on the figure as Plant Site. The Megapond, is shown, but is not labeled only because other process ponds on the figure are not labled. The photo would be too cluttered if all ponds were labled.

This is addressed in the Waste Rock and Arimetco Heap Leach Work Plans. This level of detail is not intended for the CSM.

If you have any questions regarding the revised document or the responses to comments, please contact me at 1-406-563-5211 ext. 430.

Sincerely,

Dave McCarthy
Project Manager

FINAL DRAFT CONCEPTUAL SITE MODEL
for the YERINGTON MINE SITE

August 26, 2002

Atlantic Richfield Company has developed this Final Draft Conceptual Site Model (CSM) for the Yerington Mine Site to assist the Yerington Technical Work Group (YTWG) in discussions regarding site investigations to be performed per the Closure Scope of Work and associated Work Plans. Three figures are attached to this text description: a flow diagram that illustrates potential sources, transport mechanisms, exposure pathways and receptors; a schematic block diagram that depicts these site model components, and a map of surface mine units and other relevant features overlain on a 2001 aerial photograph of the site.

The purpose of the CSM is to illustrate and describe a basic understanding of potential sources and media pathways, and possible receptors, based upon available site information. The CSM is not intended to provide details or quantification of these potential sources and pathways. More detailed information about potential sources and pathways will be presented in specific Work Plans for site closure. The CSM is considered a dynamic tool that will allow for hypothesis testing of the concepts described below, and graphically represented in the attached figures. Results of site investigations outlined in the Closure Scope of Work will improve the CSM. Atlantic Richfield anticipates that an updated CSM can be presented to the YTWG in 2003.

Potential Sources

Figure 1 is a flow diagram that illustrates three potential source categories (past and/or present) of constituents of concern (COCs) that may present a risk to human health and the environment. With the exception of possible past discharges of process solutions to the environment, these sources are also depicted in Figure 2, a schematic block diagram of surface mine units and important site and area features. All identified surface mine units, and related process areas, that may be current sources of COCs are shown in Figure 3. Identified source categories include:

- Surface mine units, and process areas (historic and current);
- Discharges of process solutions (historic discharges directly onto the natural ground surface or into unlined ponds, including infiltration to groundwater through the vadose zone); and
- The Yerington Pit Lake.

<u>Surface Mine Units and Process Areas</u>

Surface mine units, process areas and related mine site components are schematically presented in Figure 2, and major mine units are shown in Figure 3. Major surface units include tailings areas, process ponds, waste rock areas and leached ore heaps (heaps are constructed on relatively impermeable liners). Process, storage and maintenance areas associated with past mine operations are also potential sources. Additional mine units include solution pipelines (transite, metal or HDPE) and trenches, landfills and sewage lagoons.

Existing mine units are schematically shown in Figure 2. All surface mine units and disturbed areas are potential sources of fugitive dust. However, for the sake of the graphic representation in Figure 2, only the schematic waste rock pile, tailings pile and leach pad are shown to be sources on the figure. Also, fugitive dust may accumulate on or off the site, and may be re-suspended from either location by wind erosion (also indicated in Figure 1). Current active evaporation of heap drain-down may also be a source of COCs).

The schematic process and fuel storage area with buildings and ponds shown in Figure 2 is intended to represent both the Arimetco Electrowinning Plant site and the Mill and Precipitation Plant site on either side of the Weed Heights access road. Soils in these areas may be potentially contaminated by acidic solutions or petroleum hydrocarbons. Generic ponds and pipelines that may have been used for a variety of purposes, and composed of a variety of materials, are also schematically represented on the block diagram.

Discharges Of Process Solutions

Past discharges during mining operations of mine tailings (in slurry form) to lined and unlined impoundments, and discharges of acidic process solutions onto the natural ground surface and into lined and unlined evaporation ponds and designed solution collection ditches may have sourced COCs to underlying soils, the vadose zone and to groundwater via infiltration. Mine-related groundwater may also have entered the Wabuska Drain (a pre-existing agricultural return-flow ditch).

Yerington Pit Lake

The Yerington Pit Lake is a surface water body that has resulted from the accumulation of groundwater inflows to the pit from alluvial and bedrock flow systems, and from surface water derived from the Walker River (diverted during the 1997 flood). Groundwater inflows refilling the pit since the cessation of mine dewatering operations have a geochemical signature resulting from ambient chemical conditions and the interaction of groundwater with exposed bedrock in the pit walls. Mixing of groundwater types, evapoconcentration of dissolved constituents, and limnological processes in the pit lake result in evolving and complex pit lake water quality. The Yerington Pit is currently filling with groundwater, seepage from the Walker River through the alluvium, and alluvial groundwater flows. Future water balance conditions may allow pit water to flow into the bedrock groundwater flow system or allow the pit lake to serve as an evaporative sink.

Constituents of Concern

Based on the results of site investigations conducted to date, the following COCs have been identified at the Yerington Mine: arsenic, beryllium, cadmium, chromium, copper, iron, lead, manganese, selenium and zinc.

Potential Pathways

Potential pathways have been identified based on media, and include fugitive dust, soil, sediment, surface water and groundwater. These pathways may be linked to one another by various transport mechanisms, as shown in Figure 1 (light gray text and arrows). For example: fugitive dust (air pathway) may be linked to soils through dust accumulations and re-suspension of dust; sediment may be linked to surface water via leaching/runoff or sedimentation/chemical precipitation. These pathways provide the links between sources and receptors. Release mechanisms of constituents of concern (COCs) from potential sources may include wind and runoff erosion, percolation of dissolved constituents from historic process water ponds, and leaching by meteoric water of surface mine units and process areas. These mechanisms are also shown schematically in Figure 2.

Erosion

Fugitive dust and contained COCs may be released and transported to potential receptors by wind erosion and atmospheric dispersion, which may accumulate in residential or non-residential areas. Erosion of surface mine units due to surface water runoff (e.g., stormwater or snowmelt events) may also occur at the Yerington Mine Site. Wind and runoff erosion may also release COCs to soils, sediments and surface water (e.g., the Wabuska Drain). Areas of soil, sediment or dust accumulation may become secondary sources of COCs to groundwater via leaching and percolation (Figure 1).

Percolation

Percolation of historic process solutions into the soil column, vadose zone and groundwater is a potential release mechanism that likely ceased when mine operations ended, when such solutions evaporated, and/or when surface mine units dried sufficiently to increase moisture storage capacity. Geochemical processes such as mobilization and attenuation may modify the concentration of COCs in percolating process solutions or leachate through soils or the underlying vadose zone (Figures 1 and 2).

Leaching

Leaching of COCs from surface mine units into underlying soils, the vadose zone and groundwater aquifers are also identified as potential release mechanisms. Infiltration of meteoric water containing leached COCs may provide a link between identified potential sources and the groundwater pathway (Figures 1 and 2). For example, the cross-sections of various mine units shown in Figure 2 depict the potential for meteoric water (as precipitation) to leach (mobilize) constituents from mine unit materials. Conversely, some COCs in meteoric water infiltrating through mine units may be attenuated (e.g., via adsorption).

Transport Mechanisms

A number of transport mechanisms link COCs released from potential sources to potential receptors. For example, fine-grained materials eroded from surface units and process areas may be transported by wind erosion and atmospheric dispersion (as fugitive dust) to downwind areas where they may accumulate and be re-mobilized. Other examples of transport mechanisms include historic discharges to ponds or solution ditches that may have entered, and been conveyed by, the Wabuska Drain to down-gradient receptors, and the potential release of COCs from sediments in the Drain to down-gradient receptors.

Additional transport-related mechanisms or processes that may occur at the Yerington Mine Site are schematically represented in Figures 1 and 2. These include geochemical mobilization and attenuation during the infiltration of process waters or meteoric waters through the soil column and the vadose zone. Sedimentation and/or chemical precipitation may link sediment and surface water pathways. Similarly, seepage of groundwater to the Wabuska Drain or recharge from surface mine units and/or the Wabuska Drain to groundwater may also occur. Important groundwater processes (not schematically presented in Figures 1 and 2) that may affect the transport of COCs include colloidal transport, the presence of aquitards (i.e., clay layers), dispersion and dilution.

The Yerington Pit Lake is hypothesized to currently be functioning as an evaporative sink. However, it is possible that groundwater may flow out of, and transport COCs from, the pit lake into the bedrock flow system when the pit lake reaches an "equilibrated" state. This potential transport mechanism is also shown in Figure 1.

Potential Receptors and Exposure Routes

Potential receptors include humans (workers, visitors and residents) and ecological (terrestrial and aquatic biota). Terrestrial biota may include wildlife or domesticated animals. Aquatic biota may include waterfowl, as schematically shown on Figure 2. Potential exposure routes to ecological receptors include the ingestion of, and dermal contact with, soils and surface water (Figure 2). Exposure routes to human receptors include:

- Ingestion of, or dermal contact with, COCs in soils and sediments;

- Inhalation of COCs in fugitive dust;
- Ingestion of COCs in groundwater;
- Ingestion of, or dermal contact with, COCs in surface water; and
- Ingestion of crops that uptake COCs from soils.

Uptake of COCs from soil and water by plants, or direct ingestion of water, may lead to possible bioaccumulation through the food web for various biotic and human receptors. Ecological receptors may also be exposed via dermal contact and the inhalation of dust. Fugitive dust generated during operations, and since mining operations ended, may contain COCs that could be inhaled by downwind workers, visitors or residents. The primary high-speed wind direction capable of suspending dust in the area of the Yerington Mine Site is to the northeast.

Soils developed on, or eroded from, surface mine units or associated with process areas may be mechanically transported into surface water features or COCs may be leached into the underlying soil column, vadose zone and groundwater. Historically discharged and ponded process solutions may have sourced COCs to groundwater aquifers by percolation. However, percolation ceased when mining operations ended and remaining water in the ponds evaporated. Remaining solids (i.e., precipitates) in the ponds may source COCs into the underlying soil column, vadose zone and groundwater via leaching by meteoric water (if sufficient head is available).

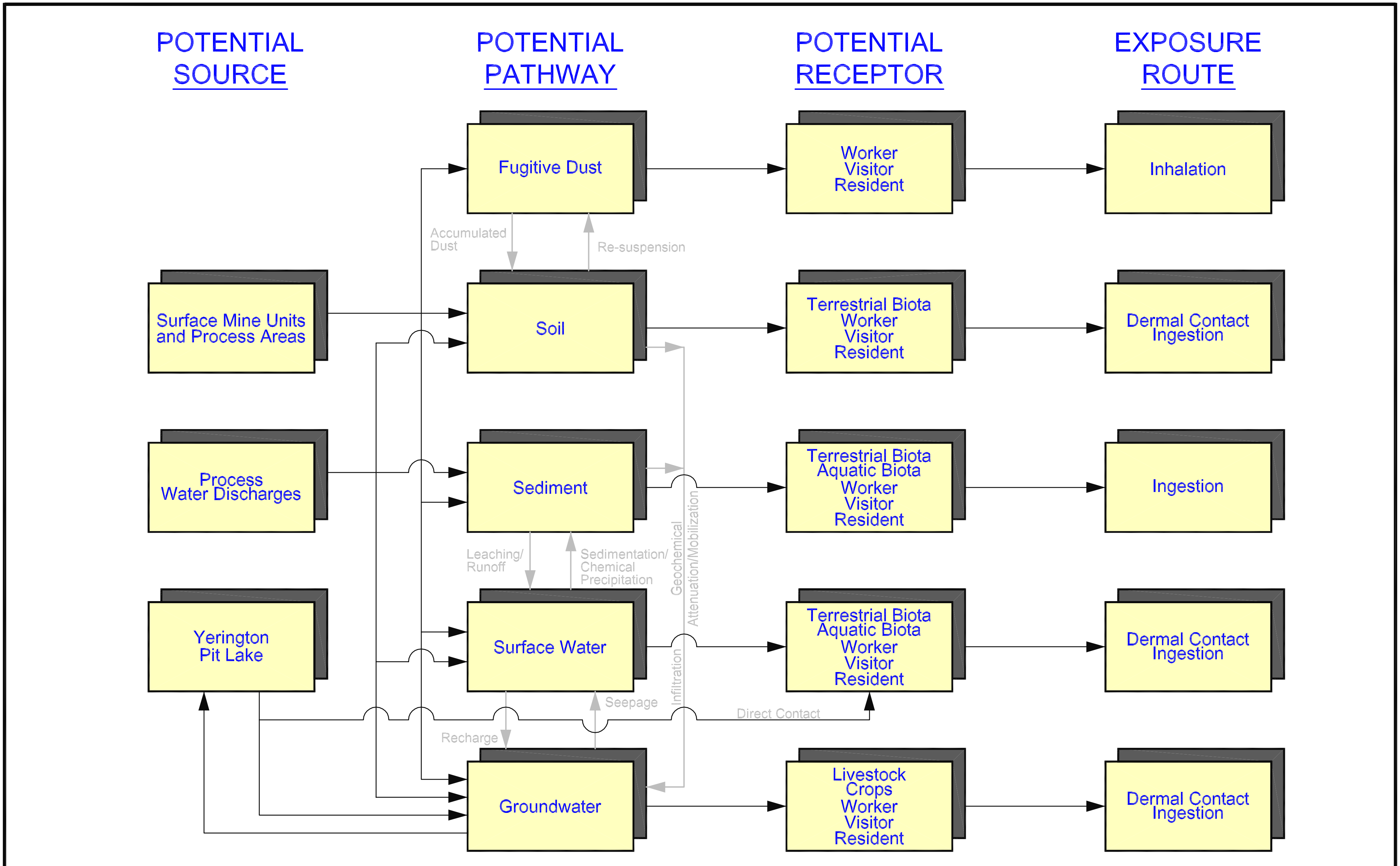
Existing surface units and inactive process areas may source COCs into the underlying soil column and vadose zone via unsaturated flow as a result of meteoric water flux through the units or areas. If moisture storage conditions in the surface units, underlying soils and vadose zone are exceeded as a result of direct precipitation or run-off, COCs may be leached into groundwater. Geochemical mobilization and attenuation processes will affect the ultimate loading of COCs to groundwater.

Additional Information

Important off-site features shown in Figure 2 include the Walker River and the Wabuska Drain. The river flow direction changes from north to northeast as it flows past the mine site, and the Drain was designed to flow to the north. The Drain returns to the River some 13 miles north of the mine site. Not shown on the block diagram, but seen in the cross section of the Yerington Pit, is the occurrence of flows from the Walker River through the alluvium into the pit. Groundwater conditions are generically depicted in Figure 2, but are too complex to show in any detail on this figure.

Groundwater flow direction and gradients can be influenced by recharge and discharge components. The major source of groundwater recharge in the northern portion of the mine site is the result of agricultural applications of surface water diverted from the Walker River and groundwater pumped from depth by supply wells. Additional sources of groundwater recharge in the southern portion of the mine site include recharge from the Walker River and from precipitation in the adjacent mountain block (Singatse Range). Discharge components that affect groundwater transport of COCs include the pumpback well system and evapotranspiration. Groundwater flow in the alluvium is generally to the north and northwest. Flow directions in the bedrock are not well known, but are likely affected by the Yerington Pit.

FIGURES



DATE:	PROJECT NUMBER:
August 2002	21243

BROWN AND CALDWELL

Explanation

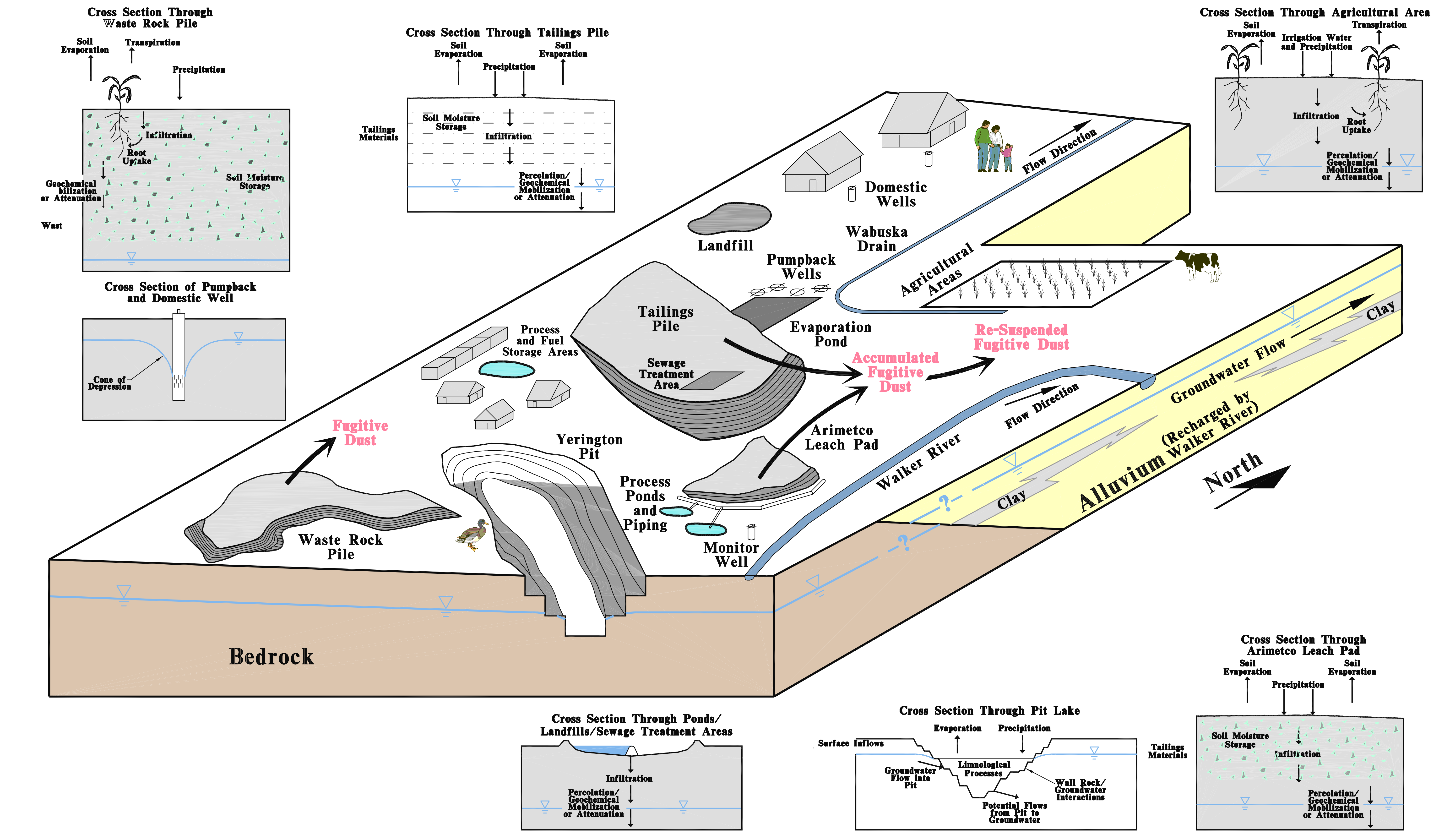
Potential Source-Media-Receptor Pathways

Inter-Media Transport Mechanism

Figure 1

Yerington Mine Conceptual Site Model Flow Diagram

Carson City Cad: P:\ARCO\21243\Site Model\CAD\F21243001.dwg (1=1) 08/16/2002 15:21:07 RJJ



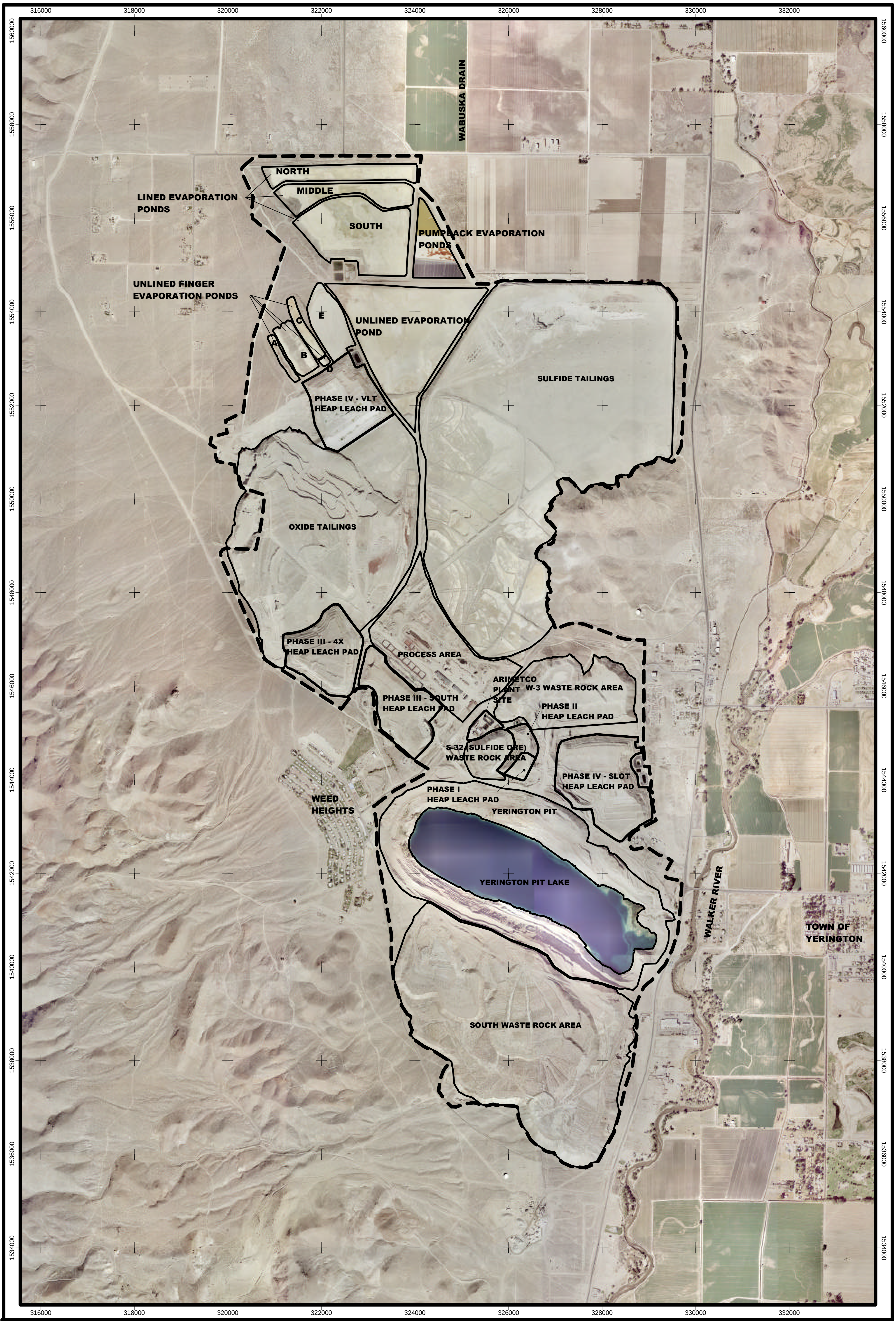
BROWN AND CALDWELL
Carson City, Nevada

DATE:	August 2002
CLIENT:	Atlantic Richfield Company
PROJECT NUMBER:	21243

Figure 2

Yerington Mine Site Conceptu Block Diagram

Carson City Cad: P:\ARCO\21243\Site Model\CAD\F21243005.dwg (1=1) 08/23/2002 09:03:03 RJJ



NOTES:
1.) PROJECTION: NEVADA STATE PLANE, WEST ZONE
1927 NORTH AMERICAN DATUM (FEET)
2.) BASE PHOTO TAKEN OCTOBER 2001

EXPLANATION

MINE BOUNDARY

MINE UNIT

BROWN AND CALDWELL
Carson City, Nevada

DATE: AUGUST 2002

Atlantic Richfield Company

PROJECT NUMBER: 21243

SCALE:
700 0 700 1400 Feet
1:24000

N

FIGURE 3
SURFACE MINE UNITS

YERINGTON, NEVADA